Laser Assisted Particle Removal

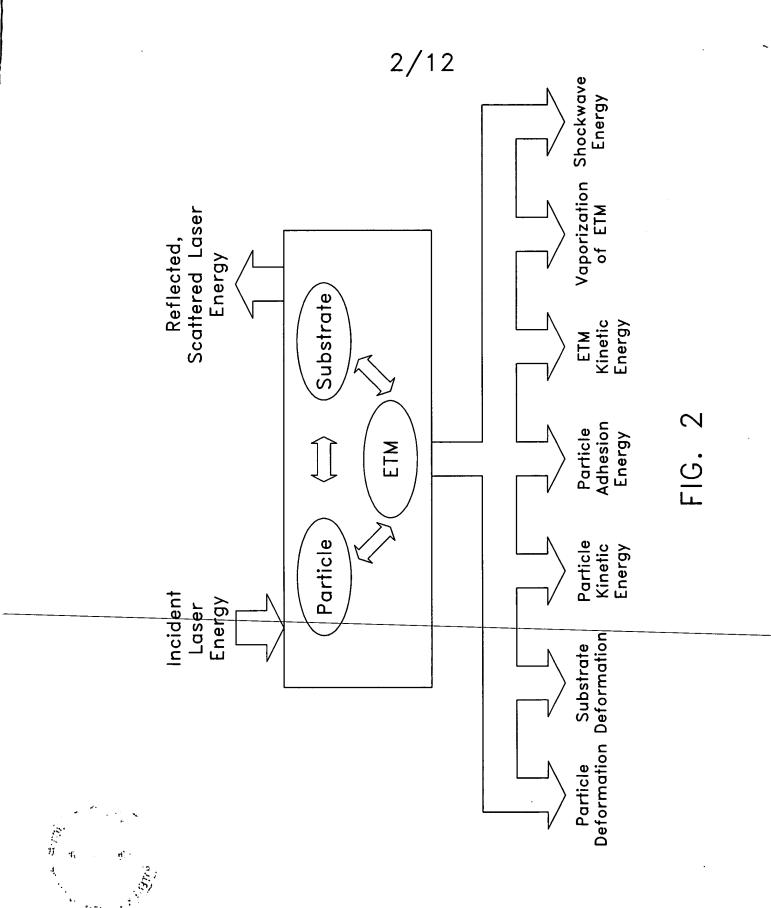
Chemical Mechanisms

- Photochemical reactive removal
- Photo— + thermo chemical reactive removal

Mechanical Mechanisms

- Particle deformation
- Substrate deformation
- Energy transfer medium explosive evaporation

FIG. 1



			I Z		
Substrate without ETM	Rapid thermal expansion of the substrate	λ>>Particle Diameter or λ <particle diameter<br="">if α_{porticle} is Ιοw</particle>	High α _{substrate}	Melting/Ablation of particle or substrate	Φ _{th} =0.02-0.3 J/cm ² . I _{th} =1-30 MW/cm ² t=7-30 ns
Substrate with ETM	Microbubble formation at liquid/solid interface	λ>Particle Diameter	High α _{substrate}	-Melting/Ablation of particle or substrate -Shockwave in ETM	Φ _{th} =0.02-0.3 J/cm ² I _{th} =2-600 MW/cm ² t=0.03-20 ns
ETM	Explosive evaporation of ETM	λ>>Particle Diameter	High α _{ETW}	Shockwave, substrate absorption	Φ _{th} =0.65-2.2 J/cm ² I _{th} =3-11 MW/cm ²
0	mal of	icle Diameter	^	lation le	-0.08 J/cm² MW/cm²
Particle	Rapid thermal expansion of particle	λ< <particle d<="" td=""><td>a particle of Substrate</td><td>-Melting/Ablation of particle</td><td>Φ_{th} =0.01-0.08 I_{th} =1-11 MW D=20μm</td></particle>	a particle of Substrate	-Melting/Ablation of particle	Φ _{th} =0.01-0.08 I _{th} =1-11 MW D=20μm
Absorption Medium	Removal Mechanism	wavelength	Energy Absorption	Substrate Damage	Particle Removal Threshold

FIG. 3

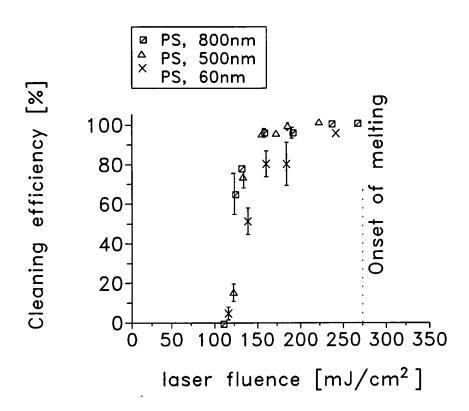


FIG. 4

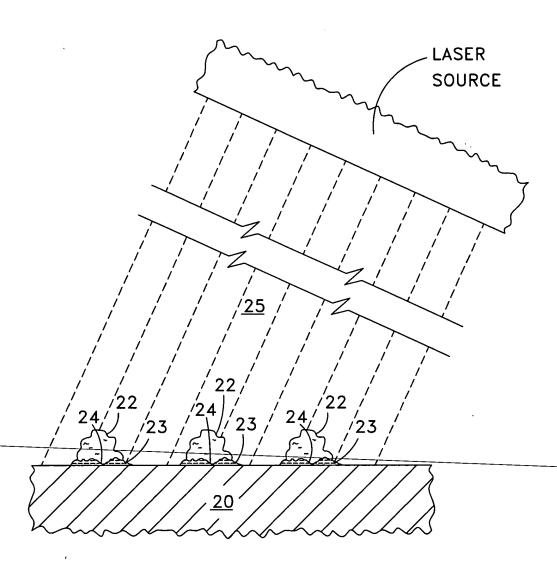


FIG. 5

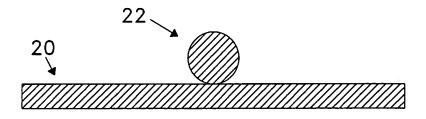


FIG. 6A

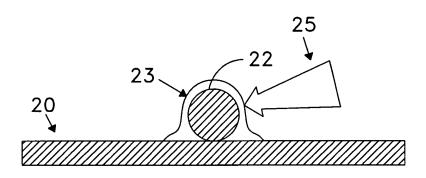


FIG. 6B

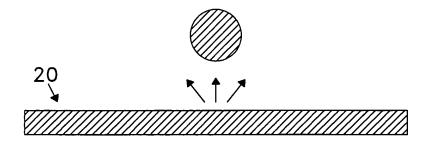


FIG. 6C

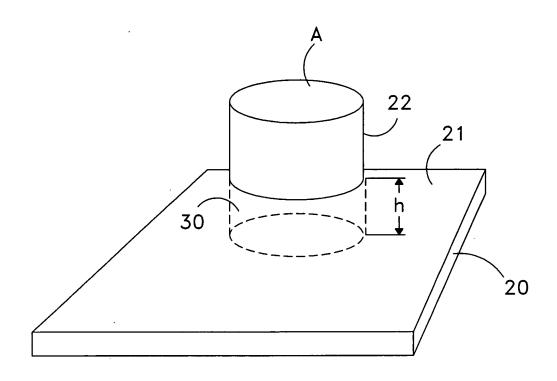
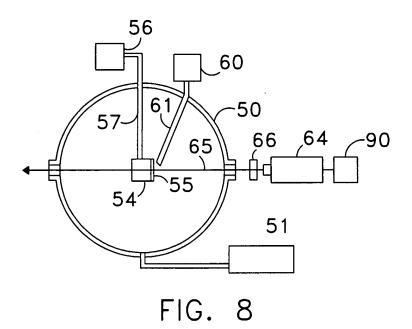


FIG. 7



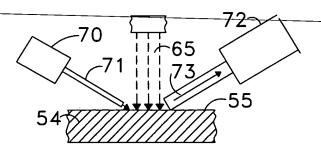


FIG. 9

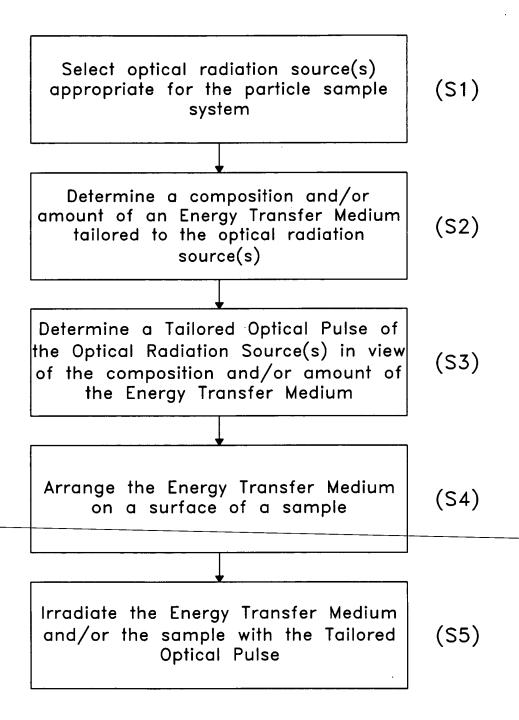


FIG. 10

<u>100</u>

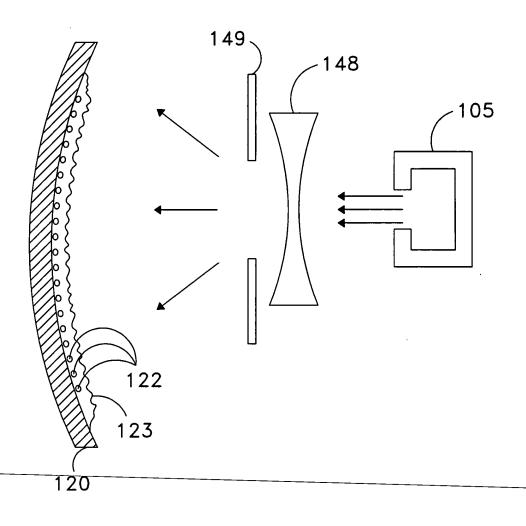


FIG. 11

100

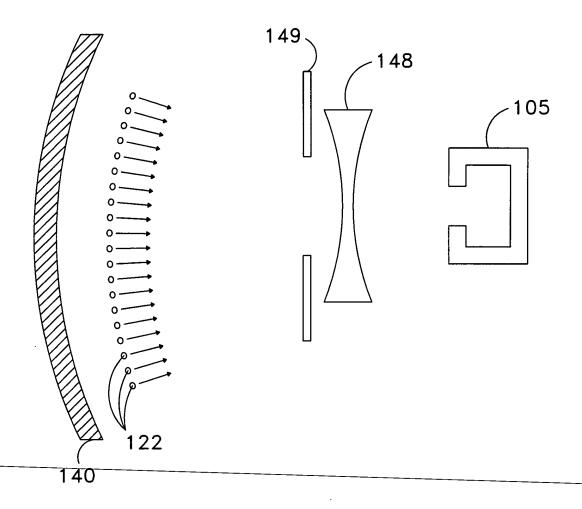


FIG. 12

<u>200</u>

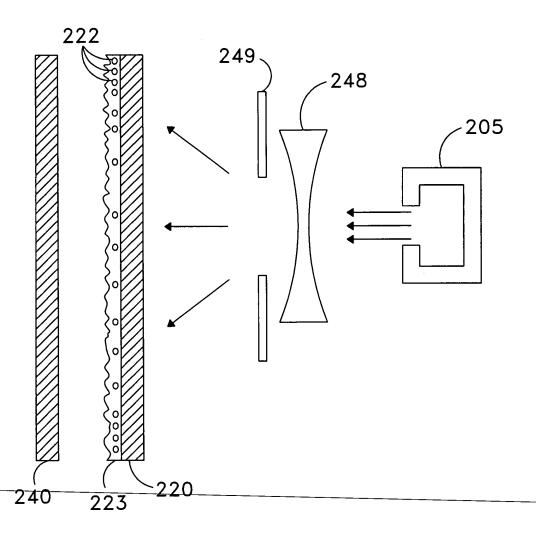


FIG. 13